TABLE 1.—*Solar radiation intensities during December, 1928*

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.

Date	Sun's zenith distance: 8a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Dec. 5	4.37	0.81	0.98	1.09	1.28	------	1.31	1.13	0.99	0.81	4.57
6	3.81	0.84	0.99	1.09	1.19	------	------	------	------	------	4.75
8	12.24	------	------	------	------	------	1.37	1.22	1.12	1.01	3.00
9	0.79	0.87	0.99	1.17	1.37	------	------	1.17	1.01	0.87	0.86
10	1.88	0.73	0.85	0.99	1.25	------	------	1.10	0.96	------	1.37
17	1.52	0.94	1.05	1.20	1.38	------	------	1.17	1.07	0.93	1.88
19	1.07	------	------	------	1.28	------	------	------	------	------	1.12
27	2.36	0.59	0.75	0.92	1.08	------	------	1.00	------	------	2.87
28	3.30	------	------	------	1.32	------	------	------	------	------	3.15
Means	------	**0.80**	**0.94**	**1.08**	**1.27**	------	**(1.34)**	**1.13**	**1.03**	**0.90**	------
Departures	------	**+0.01**	**+0.04**	**+0.03**	**+0.04**	------	------	**+0.10**	**+0.12**	**+0.11**	------
MADISON, WIS.											
Dec. 2	1.32	------	------	1.30	------	------	------	------	------	------	1.52
20	1.78	1.08	1.18	1.28	1.39	1.51	------	1.27	------	------	2.26
21	1.68	0.85	1.02	1.15	------	------	------	1.04	------	------	2.36
23	1.45	1.00	1.11	1.24	1.38	1.53	------	1.21	------	------	1.96
Means	------	**0.98**	**1.10**	**1.24**	**(1.38)**	**(1.52)**	------	**1.17**	------	------	------
Departures	------	**+0.02**	**±0.00**	**+0.02**	**+0.06**	------	------	**−0.10**	------	------	------
LINCOLN, NEBR.											
Dec. 8	0.86	------	1.19	1.39	1.49	1.60	------	1.01	1.01	0.92	0.71
9	0.51	0.84	1.01	1.14	------	------	------	1.09	0.98	0.77	1.78
14	3.15	0.81	1.06	1.16	------	------	------	------	------	------	4.75
15	0.96	1.07	1.20	1.33	------	1.64	------	------	1.19	1.05	0.86
16	0.91	------	0.86	1.09	------	------	------	------	------	------	1.12
17	0.96	1.09	1.21	1.29	1.36	------	------	1.16	0.99	------	0.96
19	0.86	1.00	1.12	1.31	1.50	------	------	------	------	------	0.81
20	1.07	------	1.11	1.22	------	------	------	1.17	1.03	0.98	0.96
21	1.52	------	1.07	1.15	------	------	------	------	------	------	1.96
Means	------	**0.96**	**1.09**	**1.23**	**1.45**	**(1.62)**	------	**1.11**	**1.04**	**0.93**	------
Departures	------	**+0.02**	**+0.03**	**±0.00**	**+0.06**	------	------	**−0.09**	**−0.03**	**−0.03**	------

* Extrapolated.

TABLE 2.—*Solar and sky radiation received on a horizontal surface*

[Gram-calories per square centimeter of horizontal surface]

Week beginning—	Average daily radiation: Washington	Madison	Lincoln	Chicago	New York	Twin Falls	Average daily departure from normal: Washington	Madison	Lincoln
1927									
Dec. 3	150	125	185	97	105	171	+8	+8	+15
Dec. 10	124	76	183	47	72	132	−17	−44	+10
Dec. 17	182	151	198	78	141	------	+39	+26	+26
Dec. 24	143	85	172	66	112	152	−1	+46	−7
Deficiency at end of year							−8,415	−5,618	−7,035

POSITIONS AND AREAS OF SUN SPOTS

Communicated by Capt. C. S. Freeman, Superintendent U. S. Naval Observatory]

Data furnished by Naval Observatory, in cooperation with Harvard, Yerkes, and Mount Wilson observatories]

Date	Eastern standard civil time	Heliographic: Longitude	Heliographic: Latitude	Area [1]: Spot	Area [1]: Group	Total area for each day
1927	*h. m.*	°	°			
Nov. 8 (Harvard)	13 15	−23.0	−8.0	------	153	153
Nov. 10 (Harvard)	10 45	−72.0	+5.5	------	97	------
		−67.0	−5.0	------	795	------
		−17.5	+7.5	------	159	------
		+2.0	−8.0	------	1,082	2,133
Nov. 25 (Harvard)	14 00	+3.0	−15.5	------	1,194	------
		+14.0	−13.0	------	64	------
		+18.5	−13.0	165	------	------
		+51.5	+11.5	------	436	------
		+68.0	−5.5	------	244	2,103
Dec. 1 (Naval Observatory)	11 51	−37.0	+13.5	6	------	------
		−33.5	−11.0	15	------	------
		+25.0	−15.5	------	77	------
		+74.0	−18.0	------	93	------
		+85.0	−16.0	------	463	654
Dec. 2 (Mount Wilson)	11 40	−75.0	+7.0	33	------	------
		−55.0	−14.0	------	24	------
		−20.0	−10.0	31	------	------
		+39.0	−14.0	35	------	123
Dec. 4 (Mount Wilson)	14 15	−25.0	−21.0	------	22	------
		+66.0	−14.0	------	3	25
Dec. 5 (Naval Observatory)	11 42	−83.0	+18.5	62	------	------
		−42.5	−11.5	------	31	------
		−14.5	−22.0	------	108	201
Dec. 6 (Naval Observatory)	11 42	−75.0	−10.5	------	154	------
		−74.0	+18.5	62	------	------
		−66.5	+19.0	62	------	------
		−29.0	−12.0	------	62	------
		−5.0	−21.5	------	46	------
		+0.5	−21.0	------	62	448
Dec. 7 (Harvard)	14 48	−60.0	−10.5	------	468	------
		−55.0	+18.5	------	162	------
		−9.5	−10.5	------	109	------
		+15.0	−21.5	68	------	------
		+29.0	+11.5	------	161	968
Dec. 8 (Naval Observatory)	11 36	−77.0	+4.5	123	------	------
		−49.5	−11.0	------	62	------
		−47.5	+19.0	31	------	------
		−42.5	−9.5	------	77	------
		−37.5	+19.5	46	------	------
		−3.0	−11.5	62	------	------
		+2.0	−11.0	------	62	------
		+6.0	−9.5	46	------	------
		+22.0	−22.0	31	------	------
		+28.5	−21.5	31	------	571
Dec. 9 (Naval Observatory)	11 41	−64.5	+5.0	139	------	------
		−37.5	−10.5	------	46	------
		−34.0	+19.5	31	------	------
		−29.5	−8.5	------	46	------
		−25.0	+20.0	46	------	------
		+9.0	−11.0	------	123	------
		+14.5	−10.0	------	170	------
		+44.5	−11.0	------	37	------
		+48.0	−10.0	31	------	669
Dec. 10 (Naval Observatory)	11 41	−50.5	+5.0	139	------	------
		−23.0	−10.5	------	31	------
		−17.5	−8.5	------	46	------
		+21.5	−12.0	------	247	------
		+26.5	−13.0	------	46	------
		+29.0	−9.5	------	123	------
		+55.0	−19.5	31	------	------
		+58.5	−12.0	46	------	709
Dec. 12 (Harvard)	14 40	−22.0	+4.5	49	------	------
		+13.0	−6.5	171	------	------
		+54.5	−10.0	------	1,864	2,084
Dec. 14 (Naval Observatory)	11 37	+2.5	+5.0	------	139	------
		+14.5	−15.0	6	------	------
		+39.0	−9.0	25	------	------
		+73.0	−14.5	------	216	------
		+77.0	−12.0	------	62	448

[1] Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column.

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic		Area		Total area for each day
		Longitude	Latitude	Spot	Group	
1927	h. m.	°	°			
Dec. 15 (Mount Wilson)	14 30	−64.0	+17.0	3		
		+18.0	+4.5		141	
		+56.0	−7.0		21	165
Dec. 16 (Mount Wilson)	18 0	+34.5	+5.0		136	
		+53.5	+13.0	12		
		+68.0	−8.0		19	167
Dec. 17 (Naval Observatory)	11 39	+44.0	+5.0	77		77
Dec. 18 (Naval Observatory)	11 51	+58.0	+5.0		62	62
Dec. 19 (Naval Observatory)	11 50	−14.0	+15.5	15		
		−11.0	+15.0	15		
		+70.0	+5.0		62	92
Dec. 20 (Naval Observatory)	11 42	−2.5	+15.5		15	
		+0.5	+15.0		31	46
Dec. 21 (Naval Observatory)	14 12	+14.0	+16.0		62	
		+17.5	+15.0		31	93
Dec. 22 (Naval Observatory)	13 10	+27.5	+16.0		15	
		+30.0	+14.5		46	61
Dec. 23 (Naval Observatory)	11 55	−21.5	+19.5		9	
		+13.0	−11.5		46	
		+13.5	+19.5		15	
		+24.0	−13.0		31	
		+40.0	+16.5		31	
		+42.0	+15.0		77	
		+46.0	+14.0	15		224
Dec. 24 (Naval Observatory)	11 45	−34.5	+10.5		46	
		−9.0	+20.5	12		
		−4.5	+19.0	6		
		+10.5	−13.0		62	
		+23.5	−11.0	46		
		+29.5	−11.5		37	
		+53.0	+17.0		46	
		+56.0	+15.0		77	
		+60.0	+14.0	15		347
Dec. 25 (Naval Observatory)	11 46	−25.0	+14.0		93	
		−20.5	+11.0		31	
		+6.0	+20.0		6	
		+9.5	+19.0		9	

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic		Area		Total area for each day
		Longitude	Latitude	Spot	Group	
1927	h. m.	°	°			
Dec. 25 (Naval Observatory)	11 46	+22.0	−12.5		31	
		+27.0	−11.5		46	
		+37.5	−11.5		46	
		+43.0	−11.5		77	339
Dec. 26 (Naval Observatory)	11 42	−14.0	+14.5		93	
		−9.5	+13.0		31	
		−7.0	+13.0	108		
		−6.0	+10.0	9		
		+35.0	−12.5		31	
		+40.0	−11.0	62		
		+49.5	−11.5	37		
		+57.5	−11.5		62	433
Dec. 27 (Naval Observatory)	11 43	−72.5	−15.0	139		
		−0.5	+14.5		93	
		+3.5	+12.5		77	
		+8.0	+12.5	154		
		+54.0	−11.0	62		525
Dec. 28 (Naval Observatory)	11 38	−83.0	−9.0	216		
		−70.0	−5.0	46		
		−58.5	−15.5	139		
		+16.0	+15.5		31	
		+17.0	+13.0		93	
		+22.0	+12.5	185		
		+65.0	−11.0	62		772
Dec. 30 (Mount Wilson)	14 45	−54.0	−9.0		524	
		−42.0	−5.0	13		
		−31.0	−15.0	108		
		+46.0	+12.0		289	934
Dec. 31 (Mount Wilson)	14 30	−78.0	−9.0	57		
		−41.0	−9.0		463	
		−29.0	−5.0		6	
		−16.0	−15.0		152	
		+25.0	+8.0		14	
		+50.0	−13.0	4		
		+62.0	+12.0		227	923
Mean daily area for December						450

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

Free-air temperatures were below normal at practically every level at all stations except Washington. (See Table 1.) Departures were exceptionally large at Ellendale and Broken Arrow. The consistent positive departures at Washington are in close agreement with those shown for this region in Chart 111, as are also the negative departures at the other stations.

As is generally the case when large negative temperature departures occur, the resultant winds contain a much greater northerly component than normally. This was especially pronounced in the lower levels at Ellendale where the largest temperature departures occurred. (See Table 2.) However, negative temperature departures are not always accompanied by an excess of northerly or a deficiency of southerly air movement. An inverse relationship is strikingly shown at Broken Arrow from 750 to 1,500 meters, inclusive, where the resultant winds contained a larger southerly component than normal, although the largest negative temperature departures for this station are found at these same levels. The monthly resultants at the other kite stations were close to normal.

The resultant wind movement as indicated by pilot balloon observations contained a north to west component at the 3,000-meter level over the entire country. At San Juan an easterly component prevailed in the monthly resultants from the surface to 4,500 meters.

Relative humidities averaged unusually high in the upper levels at the two southern stations, Broken Arrow and Groesbeck. This excess of relative humidity resulted in large positive vapor pressure departures in these regions. Both of these stations had a large number of cloudy days during the month.